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Estimated Average of Rice Crop to Reduce Pests and Diseases

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Introduction

The purpose is to introduce the reader to the major or devastating diseases of rice. Three fungal diseases, blast, sheath blight and sheath-rot, the bacterial disease, bacterial blight of rice and the viral disease, rice tungro disease, are listed as major diseases of rice [1]. The list may not be entirely correct for certain rice ecologies of the world. In Asia where more than half of the world's rice is produced and consumed, these five diseases are major production constraints. These are also diseases for which lots of scientific information is available because they have been studied in detail due to the devastations they cause to rice production. Blast is considered the principal disease of rice because of its wide distribution and high incidence under favorable conditions [2]. Valent considered the disease as the world's chief disease of rice about which a lot has to be learned yet. The disease is distributed in about 85 countries in all continents where rice is cultivated. It is a potentially damaging disease in upland environment where drought and soil stress predispose the rice crop to severe attacks by the pathogen [3]. Yield loss due to blast can be as high as 50% when the disease occurs in epidemic proportions. The damage to the rice crop is often influenced by environmental factors. Rice blast disease finds its place in biological terrorism because of the potential devastation it can cause to rice production. The fungus attacks the crop at all stages of crop growth [4]. Symptoms appear on leaves, nodes, rachis, and glumes. On the leaves, the lesions appear as small bluish green flecks, which enlarge under moist weather to form the characteristic spindle shaped spots with grey centre and dark brown margin. The spots coalesce as the disease progresses and large areas of the leaves dry up and wither [5]. Spots also appear on sheath. Severely infected nursery and field appear as burnt. Black lesions appear on nodes girdling them. The affected nodes may break up and all the plant parts above the infected nodes may die. During flower emergence, the fungus attacks the peduncle and the lesion turns to brownish-black which is referred to as rotten neck / neck rot / panicle blast. In early neck infection, grain filling does not occur while in late infection, partial grain filling occurs. Small brown to black spots may also be observed on glumes of the heavily infected panicles [6]. The pathogen causes yield losses ranging from 30-61 per cent depending upon the stages of infection. The mycelium is hyaline to olivaceous and septate. Conidia are produced in clusters on long septate, olivaceous conidiophores. Conidia are pyriform to ellipsoid, attached at the broader base by a hilum. Conidia are hyaline to pale olive green, usually 3 celled. The perfect state of the Leaf blast fungus is M. grisea producing perithecia [7]. The ascospores are hyaline, fusiform, 4 celled and slightly curved. Forecast for rice blast can be made on the basis of minimum night temperature range of 20-26°C in association with a high relative humidity of 90 per cent and above lasting for a period of a week or more during any of the three susceptible phases of crop growth, viz., seedling stage, post transplanting tillering stage and neck emergence stage [8]. In Japan, the first leaf blast forecasting model was developed named as BLAST. Later several other models have also been developed namely, pyricularia, pyriview, blastam, epibla and pblast. The disease spreads primarily through airborne conidia since spores of the fungus present throughout the year. Mycelium and conidia in the infected straw and seeds are major sources of inoculum. Irrigation water may carry the conidia to different fields. The fungus also survives on collateral hosts viz., Panicum repens, Digitaria marginata, Brachiaria mutica, Leersia hexandra and Echinochloa crusgalli. Spores land on leaves, germinate, penetrate the leaf, and cause a lesion 4 days later; more spores are produced in as little as 6 days. Infections from spores arriving from a distance are termed primary infections. Primary infections generally result in a few widely scattered spots on leaves. Spores arising from the primary infections are capable of causing many more infections. This cycling is called secondary spread. Secondary spread is responsible for the severe epidemics of blast in fields and localized areas [9]. Grow resistant to moderately resistant varieties CO47, IR 20, ADT36, ADT39, ASD 18 and IR64. Avoid cultivation of highly susceptible varieties viz., IR50 and TKM6 in disease favourable season. Remove and destroy the weed hosts in the field bunds and channels. The fungus attacks the crop from seedling to milky stage in main field. Symptoms appear as minute spots on the coleoptile, leaf blade, leaf sheath, and glume, being most prominent on the leaf blade and glumes. The spots become cylindrical or oval, dark brown with yellow halo later becoming circular. Several spots coalesce and the leaf dries up. The seedlings die and affected nurseries can be often recognised from a distance by scorched appearance. Dark brown or black spots also appear on glumes leading to grain discoloration. It causes failure of seed germination, seedling mortality and reduces the grain quality and weight. Bipolaris oryzae produces brown septate mycelium. Conidiophores arise singly or in small groups. They are geniculate, brown in colour. Conidia are usually curved with a bulged center and tapered ends. They are pale to golden brown in colour and are 6-14 septate. The perfect stage of the fungus is C. miyabeanus. It produces perithecia with asci containing 6-15 septate, filamentous or long cylindrical, hyaline to pale olive green ascospores. The fungus produces terpenoid phytotoxins called ophiobolin A, ophiobolin B and ophiobolin I. Ophiobolin A is most toxic. This breakdown the protein fragment of cell wall resulting in partial disruption of integrity of cell. The conidia present on infected grain and mycelium in the infected tissue are viable for 2 to 3 years. Airborne conidia infect the plants both in nursery and in main field. The fungus also survives on collateral hosts like Leersia hexandra and Echinochloa colonum. The brown spot fungus is normally present in areas with a long history of rice culture [10]. Airborne spores that are capable of causing infection are produced in infested debris and older lesions. The fungus produces short, linear brown spots mostly on leaves and also on sheaths, pedicels and glumes. The spots appear in large numbers during later stages of crop growth. Conidiophores are produced in groups and brown in colour. Conidia are hyaline or sub

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hyaline, cylindrical and 3-5 septate. Initial symptoms are noticed only on the upper most leaf sheath enclosing young panicles. The flag leaf sheath show oblong or irregular greyish brown spots. They enlarge and develop grey centre and brown margins covering major portions of the leaf sheath. The young panicles remain within the sheath or emerge partially. The panicles rot and abundant whitish powdery fungal growth is seen inside the leaf sheath. Prominent stunting of plants and excessive tillering are the characteristic symptoms of the disease. Leaves yellowish green to whitish green, become soft and droop. Plants usually remain sterile but sometimes may produce small panicles with unfilled grains. Infected plants show stunted growth, reduced tillering and root system. Leaves show chlorotic specks turning to streaks along the veins. In early stage of infection no ear heads formed. Rice dwarf virus Spreads by leafhopper feeding by Nephotettix cincticeps, Recllia dorsalis and N. nigropictus in a persistent manner. The transmission is transovarial through eggs. Gramineous weeds Echinochloa crusgalli and Panicum miliaceaum serve as source of inoculum. Plants are markedly stunted with excessive tillering and an erect growth habit.

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Conflict of Interest

None

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